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A PRELIMINARY ACCOUNT OF THE HERPETOLOGY OF THE GREAT SANDY DESERT OF CENTRAL WESTERN AUSTRALIA

Reptiles and Amphibians of the Bindibu Expedition

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Although central Australia, formerly the Northern Territory of South Australia, has received the attention of numerous scientific expeditions, both zoological and anthropological, most of this work has been carried out in the country northward from Oodnadatta to the region of Alice Springs, and particularly in the MacDonnell Ra. The MacDonnell Ra., renowned in scientific literature as the home of the Arunta tribe, extend for more than 350 miles in an E.-W. direction and form an elevated 'island' some 3,000 ft above the surrounding desert, and rise to 5,000 ft above sea level. This is predominantly a broken and rugged terrain, outcropping with rocks and boulders, but has an abundant water supply in soaks and deep rockholes and formerly supported a rich fauna, including many interesting mammals and reptiles and a relatively dense population of aborigines.

The first and most notable scientific investigation of this country was carried out by the Horn Expedition in 1894. This expedition, staffed by a group of carefully chosen workers, included Professor (later Sir) Baldwin Spencer as zoologist, and Dr E. C. Stirling, a physiologist of Adelaide University as anthropologist, and in the course of a few months of concentrated work, achieved remarkable results.

The discoveries of the Horn Expedition, both zoological and anthropological, focussed scientific interest on C. Australia, but this was centered largely on the country around Alice Springs and the territory that Finlayson, who collected mammals extensively there, knew so well and described graphically as the 'Luritja' country—a collective name loosely used for the virile tribes of the Musgrave and Petermann Ra.

But meanwhile, the vast expanse of spinifex and sand hills that stretches N. and W. of L. Mackay on the Northern Territory/Western Australian border was neglected by scientific workers. This desert and semi-desert country, extending westward for upwards of 700 or 800 miles to the Oakover R. on the NW. coast of Western Australia, was first crossed by Col. Warburton in 1872-3 and named by him the Great Sandy Desert.

Giles made several journeys into this area in the period 1872-76, and 20 years later, in 1896-7 David Carnegie, an Englishman engaged in prospecting on the Western Australian goldfields, made an extraordinary journey with camels and horses. Carnegie's journey was an epic of courage and endurance, for his party traversed both the Gibson and Great Sandy Deserts, travelling northwards across the sandhills which run E. and W. in long parallel lines for hundreds of miles. He reached Hall's Ck in the Kimberleys and returned S. on a course parallel to his route on the northward journey, in the following year. But, apart from journeys of these explorers and brief visits from one or two venturesome prospectors who travelled with camels, the area remained largely unknown and unexplored. Most recent of these visitors was Michael Terry in 1933.

On account of the low annual rainfall and lack of any surface water to sustain grass other than the rank, fibrous and indigestible *Triodia*, it is unfit for cattle. This country has never been stocked, and so it remains today in a virgin state. Except for a few rockholes there is almost no accessible permanent water in hundreds of square miles. Even camels cannot subsist in this territory unless watered at native wells, as shown by the journals of Warburton, Carnegie and Giles. The dependence of these explorers on the aborigines led to serious interference with, and cruelty to, the natives and by depleting their meagre water supply, antagonized them. It is not possible to maintain a string of camels in this desert, apart from the Canning Stock Route, now abandoned, where wells and bores were established.

In recent years, the W. end of this great no-man's land, distinguished as the Canning Basin, has been thoroughly mapped by the Bureau of Mineral Resources, staffed chiefly by geologists. But up to 1957 no account of the fauna or flora of the sand dune country of the Great Sandy Desert had been published and no systematic study of the ecology of the virgin desert country had been made.

In 1957, following reports of nomadic aborigines still living in the arid regions N. of L. Mackay, a party was organized, consisting at the outset of three men—Dr Donald F. Thomson, organizer and leader; William Hosmer, technical assistant and wireless operator; and W. McColl, driver and general assistant—sponsored by the Royal Geographical Society and the University of Melbourne, and backed by Australian Consolidated Press. The narrative of this expedition, on which we penetrated to a distance of 600 miles W. of Alice Springs, is told in *The Geographical Journal*.

Although specimens were collected whenever possible throughout the expedition, the principal collecting camps were: the neighbourhood of Mt Doreen and Mt Singleton (some 220-230 miles NW. of Alice Springs); Kimai Well; Waimbirr'ngi Bluff; Labbi Labbi Rockhole; and Wirrarigulong. The route finally adopted as the

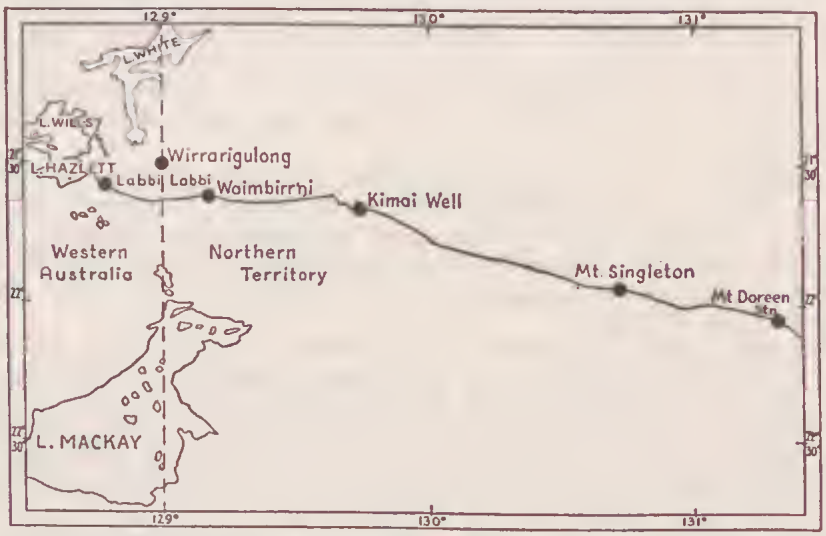

FIG. 1—Route of western reconnaissance from Mt Doreen Station (225 miles NE. of Alice Springs) to establish a depot. Labbi Labbi Rockhole, 5 miles SE. of L. Hazlett, was discovered; it provided permanent water and was selected as the site for an air drop by the R.A.A.F. Chief collecting stations are also shown on this map.

best approach to Labbi Labbi, where the forward base was established, is shown on the map (Fig. 1). A brief account of the terrain and of the associated flora in each of these areas is set out below.

The neighbourhood of Mt Doreen and the territory westward to Mt Singleton, a distance of about 60 miles, is well watered with an average annual rainfall of 10·66 inches. The country is undulating, often outcropping with rocks and boulders, and comprises savannah woodland with small patches of mulga (*Acacia aneura*). In normal seasons it is well grassed, with comparatively little spinifex (*Triodia* spp.) and is considered good cattle country. The vegetation of this area, as might be expected, is much less strongly xerophilous than in the desert farther west. Trees of this area are Eucalyptus—chiefly bloodwoods, including *E. dichromophloia* and *E. papuana*, the latter well known in C. Australia as the Ghost Gum—with numerous acacias, Grevillea and Hakea, which become dominant further W.

A short distance W. of Mt Singleton, the country becomes broken, with rock outcropping, and beyond this is a belt of dense, low, quite old mulga, after which the country changes abruptly to semi-desert with sandy plains covered with dense spinifex in place of edible grasses, which acts as an effective sand binder and restricts wind erosion. This semi-desert area showed unmistakable signs of a long drought. The spinifex was bleached a pale yellow, almost white, from long exposure to the pitiless sun and had become brittle. Isolated beefwood (Grevillea) low and gnarled, and desert oaks (*Casuarina decaisneana*) solitary or in small clumps, were noted and provided relief from the bare sand. A change was noticed at once in the character of the fauna. For several days almost no sign of life was marked—no kangaroos, wallabies or emus, nor the howl of a dingo at night. Birds were rarely heard but a few, chiefly small honeyeaters, were seen in spinifex or low undergrowth. These birds with their brushed tongues are able, no doubt, to adapt themselves to long drought and the arid conditions of desert terrain.

As Kimai Well, about 80 miles W. of Mt Singleton, was approached, bloodwoods—more dwarf and of less luxuriant habit than in the vicinity of Mt Doreen —became more frequent, singly or in small clumps on low ground below the dunes or on rocky outcrops. Desert oaks were also seen, sometimes in stands of an acre or more in extent. These trees, with their thick rough back, are extremely sensitive to fire and when the dry spinifex, impregnated with resin, burns, the she-oaks die for they do not regenerate like most of the typical trees and shrubs of the desert, most of which are of dwarf habit and have the capacity, after a spinifex fire, to send up shoots from a thick fleshy rootstock, situated often several feet below the surface. When the desert oak dies the thick, cork-like bark shrinks away from the cambium and hangs loosely, providing refuge for lizards, notably certain species of gecko and the small and attractive Lace Lizard or 'goanna' (*Varanus gilleni*) which we found in numbers in this region, always under the loose bark of dead Casuarina trees.

Two species of tea-trees, *Melaleuca lasiandra* and *M. glomerata*, were noted in the desert, sometimes growing separately, sometimes in association. These two shrubs, low, stunted, of strongly xerophilous character, were often intermingled with dwarf-growing Mallee eucalypts, especially *E. pachyphylla*, as well as with many species of Grevillea, Hakea and many acacias (Pl. XLIII, fig. 1). Mulga is often regarded as characteristic of the arid interior. It was plentiful in isolated patches in semi-desert, but rarely seen in the true desert except for small clumps which were noticed occasionally above rocky outcrops—which, after rain, dammed seepage water and left soaks—and sometimes in low troughs or depressions where rain water concentrates and the sand is intermingled with silt.

Close to Kimai the long drought broke, and a deluge of rain fell, and continued for two or three days. The effect of this rain on animals, especially lizards and small rodents, was immediately noticeable, and the vegetation also responded unbelievably.

Kimai is in the territory of the Walberi tribe—members of which are now gathered into Yuendemu and other Government Stations—but is today a hunting ground of the desert Bindibu. There is a permanent well at Kimai, 7 or 8 ft deep in sandstone rocks laid down in horizontal strata, from the seams of which water from springs seeps to maintain the level in the well. This well lies in a shallow basin or trough, roughly circular in outline and 200-300 ft across, the perimeter a sandy ridge or outcrops of limestone rock. Inside this basin are dense clumps of tea-tree, chiefly *M. glomerata*. This shrub with its 'bottle-brush' flowers attracts many insects, which no doubt provide food for the lizards that find refuge in its shade.

From Kimai Well to Waimbirr'ngi Bluff, about 45 miles W. and close to the Western Australian border, the terrain becomes more arid and gives way to true desert of red sand covered with spinifex. At Waimbirr'ngi a great outcrop of rock with large boulders rises on a bluff from which we named the camp (Pl. XLII, fig. 2). A well, fed by seepage from springs among the rocks, lies at the foot of the rocky headland, still in the territory of the Walberi tribe, and a favourite camping place of the nomadic Bindibu. Very primitive camps, noted under low shrubs close to the well showed signs of recent occupation and proved that nomadic aborigines still hunted far out in the desert. It was the detailed examination of the bones at these camp fires that gave an idea of the animal food on which these people were depending. The surrounding area was typical sandy desert terrain, rough and hummocky, covered with dense clumps of spinifex. Westward, tiers of low red sand hills in parallel lines extend like the prongs of a giant fork.

About 30 miles W. of Waimbirr'ngi, across the Western Australian border, lies the high escarpment above Red Cliff Pound, outcropping with bare, deep red rocks. From the top of these cliffs we looked across the Pound and the sunken valley beyond, encircled by low hills, to L. Hazlett, Wills and White—a bleak pale blue, or dazzling white with salt—lying 5 or 6 miles away. Above the Pound we found the fine deep rockhole, called Labbi Labbi by the natives, which was to form our base camp and most important collecting site (Pl. XLIII, fig. 2). Labbi Labbi consisted of a large rockhole in a creek bed on the fringe of the escarpment, below which were a series of smaller pools. The escarpment was rough and broken, and the outer slopes were sparsely clothed with gnarled, stunted shrubs, chiefly Grevillea. Conspicuous among these were *G. agrifolia* with its coral-red flowers, and numerous dwarf acacias, especially *Acacia monticola*, the reddish-brown bark hanging in tassel-like strips, its foliage a delicate fresh green despite its barren habitat on the rock face. Among the rocks were several species of *Solanum* with mauve or purple flowers and a number of Cassias, including *C. pruinosa* and *C. desolata*. Close to the dry water courses that wound through Hidden Valley, were found such forms as *C. notabilis* and *C. venusta*, with yellow flowers standing out against the red laterite rocks. The pound or amphitheatre was a haven, sheltered from the bitter winds of the desert, and here some interesting reptiles were collected.

Wirrarrigulong, a great shallow clay pan covering 10-15 acres in low-lying land between sand dunes about 20 miles NE. of Labbi Labbi, was discovered on a hunting expedition with the desert Bindibu, and formed one of the most interesting collecting camps in the desert. This low basin between the dunes was impregnated by a deep deposit of fine red clay. After a fall of 2 to 3 inches of rain, followed by an even heavier downpour about four weeks later, it filled with water. This clay pan,

one of the most spectacular but least reliable sources of water in the desert, carried water a foot or two in depth, coloured red from the fine particles of colloidal clay in suspension. After a short time, exposed to the intense heat of the sun, the clay pan began to dry up rapidly and within the space of a few days, in which collecting was carried out, it became undrinkable on account of the concentration of clay in suspension.

But for a few weeks Wirrarigulong was transformed and animals that we had not seen in hundreds of miles of travel in the desert suddenly appeared—emus (*Dromaius novae-hollandiae*), Red Kangaroo (*Megaleia rufa*) and even wild duck —and the vegetation in the area was almost luxuriant compared with the surrounding desert.

At each of these watering places the Bindibu who accompanied us hunted relentlessly, so that in competition with the people, who were our chief concern, we were handicapped since the natives of the desert consider almost all lizards as game, including the small and rough-skinned agamids which in less arid areas are not considered as food by the aborigines.

A total of 169 reptiles and amphibians were secured; of this number only 5 were snakes. A list of species collected on this expedition, with brief descriptions and notes, is set out below.

LACERTILIA

Family GEKKONIDAE

Genus **Nephrurus**

Nephrurus wheeleri Loveridge 1932

Proc. New England Zool. Club 13: 31 (type locality Yandil near Wiluna, W.A.).

MATERIAL EXAMINED: Labbi Labbi (SE. of L. Hazlett) W.A., 1, DFT No. 1275.

DESCRIPTION: The single specimen collected does not differ significantly from the description of the type. The only additions are in measurements. Head width 22·8 mm, head length 25·99 mm giving a width to length ratio of 0·88. Distance eye to naris 7·3 mm, internarial width 5·2 mm, ratio eye-naris to internarial width 1·40. Total length 109 mm. Length, snout to vent only, 92 mm (tail regenerated and truncated in this specimen). Colour after preservation, pale brown above with transverse dark brown bands of which the two across the nape are broadest and most distinct. Ventral surface white.

HABITAT: This bizarre-looking gecko was found under dense spinifex.

DISTRIBUTION: The species was first recorded in Wiluna on the Canning Stock Route in C. Western Australia. It appears, therefore, to be a desert-haunting species.

Genus **Heteronota**

Heteronota binoei Gray 1845

Cat. Liz. Brit. Mus. 174 (type locality Houtman's Abrolhos, W.A.).

MATERIAL EXAMINED: Mt Doreen Station, N.T., 19, DFT No. 1317-1335.

DESCRIPTION: The dorsal tubercles are arranged in 13 or 14 longitudinal rows, except in one individual (DFT No. 1335) on which they are irregularly disposed in 18 rows. This latter example agrees well with the description of *Heteronota derbiana*

(Gray), whereas the series having 13 to 14 rows of tubercles fit the description of *H. binoei* given by Boulenger (1885, p. 74). Lucas & Frost (1896, p. 120) have advanced reasons for regarding *H. derbiana* as synonymous with *H. binoei*, but after examination of this series, we are inclined to question this. Colour after preservation of the typical *H. binoei* is brown above, with distinct broad yellow crossbands, of which there are 5 on the body and 8 on the tail. *H. derbiana* form is brown above with small irregular dark brown and pale brown mottling.

HABITAT: The banded series were all taken under loose stones on a rocky hillside, but the unbanded example (DFT No. 1335) was collected under a fallen tree in open sandy country.

DISTRIBUTION: The species is widely distributed and occurs in all mainland states, but is apparently absent from the colder parts of N.S.W. and Victoria.

Genus **Peropus**

Peropus variegatus (Dumeril & Bibron)

Hemidactylus variegatus Dumeril & Bibron 1836, *Erpet. Gen.* 3: 353 (type locality Tasmania and Bay of the Chiens Marins, W.A.).

MATERIAL EXAMINED: Mt Doreen Station, N.T. 18, DFT No. 1350-1367; Labbi Labbi, W.A., 14, DFT No. 1368-1381.

DESCRIPTION: The head is longer than broad, measurements of heads of 6 adult specimens show a mean length to breadth ratio of 1·2. On account of variability of these measurements the following note is added: Measurements of head length are taken from anterior margin of ear to tip of snout; breadth at widest part of head; snout from anterior margin of eye to tip of snout. Male specimens possess from 8 to 13 preanal pores; these are absent in females. The lamellae are completely divided, inner digits are clawless. The largest specimen (DFT No. 1354)—total length 101 mm, tail 53 mm, ratio tail length to total length 0·53.

HABITAT: This species inhabits rocky terrain and all specimens taken by the expedition were found under slabs of rock.

DISTRIBUTION: The species ranges across the continent S. of a line connecting Geraldton, W.A., Alice Springs, N.T., and Mackay, Q'ld (Loveridge 1934).

Family AGAMIDAE

Genus **Amphibolurus**

Amphibolurus maculatus gularis Sternfeld 1925

Abh. Senckenb. Naturf. Gesell 38: 231 (type locality Hermannsburg, N.T.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 6, DFT No. 1288-1293.

DESCRIPTION: This race is said to differ from the typical form by the possession of a larger tympanum, being nearly as large as the eye, and its distinctive colouration. Present examples agree in detail with the above description. Mean tympanum to eye ratio for the 6 specimens is 0·90. The male (DFT No. 1288) is characterized by intense black colouration of the under surfaces of tibia and tarsus, and more prominent dorsal pattern than in the females. The male possesses 54 femoral and preanal pores, in a continuous series; these are absent in the females. Loveridge (1934, p. 318) noted a female, gravid, with a tendency towards secondary sexual colouring of males. This is true of 3 of the 5 females in which ventral areas are dusky in precisely the same areas that are black in the male.

HABITAT: This dragon appears to be the most common of the agamids occurring W. of Mt Singleton in the Great Sandy Desert, where it lives under roots of spinifex, burrowing in the sand to a depth of about a foot.

DISTRIBUTION: The centre of distribution appears to be the MacDonnell Ra. region of C. Australia, and the race is widespread in the arid interior.

Amphibolurus caudicinctus (Gunther)

Grammatophora caudicincta Gunther 1844, *Zool. Erebus & Terror. Rept.* 19 (type locality Nickol Bay, W.A.).

MATERIAL EXAMINED: Mt Doreen Station, N.T., 4, DFT No. 1251-1254.

DESCRIPTION: No attempt has been made here to untangle the complex involving the present species and two related forms, *A. imbricatus* Peters and *A. rufescens* Stirling and Zietz. Loveridge (1934, p. 319) indicates the possibility of the two latter species being races of *caudicinctus*. The 4 specimens each possess 22-24 femoral and preanal pores; the ventral scales are smooth, very faintly keeled in one specimen (DFT No. 1254). The tibia length to snout-vent length ratio ranges from 0·30 to 0·32. The dorsal colour after preservation is reddish-brown. The pattern consists of 5 or 6 narrow white cross-bands, between which are 4 round black spots, arranged transversely. The inner 2, placed one each side of the vertebral column, are most conspicuous; the outer spots, situated dorso-laterally, are less distinct. The tail is cross-barred with about 22 narrow white stripes.

HABITAT: This species occurs only in rocky terrain where it hides under slabs of rock. They are difficult to capture alive during the day when they are active, but can be secured easily at night when they are asleep beneath rocks.

DISTRIBUTION: W. and C. Australia.

Amphibolurus reticulatus inermis (De Vis)

Grammatophora inermis De Vis 1888 (1887), *Proc. Linn. Soc. N.S.W.* (2) 2: 812 (type locality central Q'ld.).

MATERIAL EXAMINED: Mt Doreen Station, N.T., 17, DFT No. 1382-1398; Kimai, N.T., 14, DFT No. 1399-1412; Labbi Labbi, W.A., 17, DFT No. 1413-1429.

DESCRIPTION: There does not appear to be any variation in the number of pores possessed by the sexes in these specimens, the males possessing a mean number of 23 femoral and preanal pores (range from 18-27) and females a mean of 22 (range from 15-25) but the pores of the females are less distinct. Largest specimen (DFT No. 1394) total length 247 mm, tail 140 mm, ratio tail length to total length 0·57. Colouring is variable, but usually consists of a network of pale yellowish-brown spots on the dorsal surface of the body, with a narrow mid-dorsal stripe of yellow or pale brown. The tail is usually uniformly brown, but indistinct pale blotches may be present; throat mottled with brown, becoming more intense and distinctly reddish in breeding males.

HABITAT: This desert race is numerous and widespread in the arid sandy regions. It burrows in the sand, often under spinifex, and in this high temperature is extremely agile. The burrow is from 2-3 ft deep. The Bindibu name for this dragon, which forms an important part of their food supply is 'linga'.

DISTRIBUTION: Sandy interior only of S.A., W.A., N.T. and Q'ld.

Amphibolurus barbatus minor Sternfeld 1919

Mitt. Senckenb. Naturf. Gesell 1: 78 (type locality Hermannsburg, MacDonnell Ranges, N.T.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 2, DFT No. 1270 and 1271.

DESCRIPTION: These 2 specimens are a male and female, both sexually mature. The male (DFT No. 1270) possesses 16 femoral and preanal pores; the female has 13 pores. Total length, both specimens, 321 mm but in the male the tail is considerably longer than in the female, ratio tail to total length being 0·71 in the male, 0·65 in the female.

HABITAT: Both lizards were brought into camp by aborigines but no aboriginal name could be given and no information as to circumstances of capture. Note: This is one of the two species of *Amphibolurus* that were collected in the desert which had retained an arboreal habit in spite of the intense heat and arid conditions. It has been regarded by Sternfeld as a small race of *A. barbatus barbatus*, but is now being re-examined.

DISTRIBUTION: C. Australia.

Genus **Tympanocryptis**

Tympanocryptis cephalus Gunther 1867

Ann. Mag. Nat. Hist. (3) 20: 52 (type locality Nickol Bay, W.A.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 6, DFT No. 1299-1304.

DESCRIPTION: Nostril closer to eye than to tip of snout; dorsal scales slightly keeled, those of the occiputal region larger and without keels; ventrals smooth, except for scales bordering lower jaw, which are obtusely keeled. Males possess 2 preanal pores, no femoral pores; pores absent in females. Ratio tail to body length in 2 male specimens (DFT No. 1299 and 1300) 1·30 and 1·33; ratio in 3 females varies from 1·01 to 1·22. Ratio, tibial length to body length ranges from 0·19 to 0·22 (mean, 0·204). Largest specimen (male DFT No. 1300) measures 122·7 mm. Colour after preservation pale orange-brown above with 5 broad but indistinct cross-bands, with 12 dark bands separated by almost white interspaces on the tail, throat dark brown in males.

HABITAT: These lizards were found in sandy areas under spinifex.

DISTRIBUTION: Range extends from N. W.A. across N.T. to Q'ld, extending S. in the N.T. to the C. parts of S.A.

Genus **Physignathus**

Physignathus longirostris (Boulenger)

Lophognathus longirostris Boulenger 1883, *Ann. Mag. Nat. Hist.* (5) 12: 225 (type locality Champion Bay and Nickol Bay, W.A.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 2, DFT No. 1272 and 1273.

DESCRIPTION: Nostril nearer to eye than to tip of snout; ratio eye-naris to internarial distance, 0·67 in the male (DFT No. 1272), 0·70 in the female (DFT No. 1273). Scales of the dorsal surface are keeled. A well-defined nuchal crest is present followed by a faint vertebral crest, becoming obscure toward base of tail. Scales of the throat appear smooth, but under a lens prove to be obtusely keeled. Scales of the belly and lower surfaces of tail strongly keeled. There are 79 rows of scales around the centre of the body in both specimens. The female is the larger

of the two specimens—total length 393 mm, tail 301 mm, ratio tail to total length 0·77, ratio tibial length to distance of snout to vent is 0·25 in both sexes. Male—total length 260 mm, tail 195 mm, ratio tail to total length 0·75. Colour after preservation is greyish-brown with a white border along the lower jaw, broadening toward the tympanum. A broad stripe of white extends from the neck to the insertion of the hind limbs. Ventral colour in male, pure white; that of the female mottled profusely with brown. The male possesses 17 femoral and 4 preanal pores, the preanal pores in two pairs separated by 8 scales; female without pores.

HABITAT: Both specimens were collected on a sand hill, where they sought refuge in dead hollow limbs of trees.

This species was nowhere numerous, and was very agile and difficult to capture.

DISTRIBUTION: Range extends from N. W.A. through the N.T. and inland S.A. to the drier parts of Q'ld. Distribution appears to be restricted to arid and semi-arid areas especially mulga country.

Genus **Moloch**

Moloch horridus Gray 1841

Grey's Journ. Exped. W. Australia 2: 441 (type locality W.A.).

MATERIAL EXAMINED: Kimai, N.T., 12, DFT No. 1233-1244.

DESCRIPTION: The series is typical of this species. The largest individual, a female (DFT No. 1237) measures 184 mm, tail length 78 mm, ratio tail length to total length 0·42. This remarkable agamid has been well described by Waite (1929).

HABITAT: Specimens were collected by natives in semi-desert country in open spinifex and mulga scrub.

DISTRIBUTION: Arid interior of C. Australia, most of W.A., S.A. and N.T. as far N. as Elliott, and possibly the drier parts of W. Q'ld.

Family VARANIDAE

Genus **Varanus**

Varanus gouldi flavirufus Mertens
(Pl. XLV, fig. 3)

Varanus (Varanus) gouldii flavirufus Mertens 1958, *Senck. Biol.* 39: 250 (type locality Alice Springs, N.T.).

MATERIAL EXAMINED: 4 specimens: Mt Singleton, W.A., 1, DFT No. 1260; Kimai, N.T., 1, DFT No. 1261; Labbi Labbi, W.A., 2, DFT No. 1262 and 1263.

DESCRIPTION: This race differs from the typical form in colour which is predominantly yellow or reddish, the 4 specimens studied agreeing with the type description. The largest is a female (DFT No. 1263) total length 764 mm. The 3 females of the series collected have tail to total length ratio ranging from 0·59 to 0·63, and eye-naris to internarial width ratio from 1·18 to 1·43. The only male (DFT No. 1260) has tail to total length ratio 0·59, eye-naris to internarial width ratio 1·39.

HABITAT: These monitors were captured in semi-arid country, sparsely covered with spinifex and stunted trees. This species is not arboreal and when hunted seeks refuge in burrows in the sand.

DISTRIBUTION: This lizard inhabits the semi-arid and desert regions of the N.T. and the interior of W.A.

Varanus gilleni Lucas & Frost 1895

(Pl. XLII, fig. 1)

Proc. Roy. Soc. Vict. 7: 266 (type locality between Glen Edith and Deering Ck, also Charlotte Waters, N.T.).

MATERIAL EXAMINED: Near Kimai Well, N.T., 3, DFT No. 1255-1257.

DESCRIPTION: A single male (adult—DFT No. 1255) and 2 females (juvenile) were collected. Claws strongly recurved, the fourth finger slightly longer than the third. Ratio, eye-naris to internarial distance in the male is 0·80, in the 2 juveniles 0·81 and 0·86. Total length of male 315 mm, tail length 174 mm, ratio tail to total length 0·55. Tails of the 2 juveniles were incomplete and measurements are not recorded.

HABITAT: This pygmy monitor inhabits the semi-desert regions where it is strictly arboreal, living under the loose bark of desert oaks (*C. decaisneana*). The species is docile and inoffensive.

DISTRIBUTION: Desert and semi-desert of S.A. through C. Australia as far N. as Newcastle Waters, N.T.

Varanus eremius Lucas & Frost 1895

(Pl. XLV, fig. 1)

Proc. Roy. Soc. Vict. 7: 267 (type locality Indracowra, N.T.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 1, DFT No. 1258.

DESCRIPTION: The specimen collected, a male, agrees with the description by Lucas & Frost (1895). Claws are slightly recurved, the third and fourth fingers equal in length. Total length 460 mm, tail length 295 mm, ratio tail to total length 0·64. Colour after preservation is orange-brown above with dark brown spots irregularly disposed over head, body and limbs. The tail has longitudinal lines, a median yellow bordered by a brown line on each side. Another dark brown line appears on each side, edged below with yellow. The throat is marbled with grey, the remainder of the undersurface cream.

HABITAT: This monitor was found in a burrow on top of a sand dune, to which it was tracked by footprints and marks of keeled tail.

DISTRIBUTION: The species ranges over the desert and semi-desert of the N.T. and W.A.

Varanus acanthurus brachyurus Sternfeld 1919

(Pl. XLV, fig. 2)

Mitt. Senckenb. Naturf. Gesell 1: 78 (type locality Hermannsburg, N.T.).

MATERIAL EXAMINED: Mt Doreen Station, N.T., 5, DFT No. 1246-1250; Labbi Labbi, W.A., 1, DFT No. 1259.

DESCRIPTION: The sample consists of one male (DFT No. 1259) and 5 females, of which 4 are juvenile. The male is the largest specimen—length 505 mm, tail length 295 mm, ratio tail to total length 0·58, tail to body length 1·40, eye-naris to internarial width 1·21. The adult female (DFT No. 1246) shows ratio of tail to total length 0·51, tail to body length 1·47, eye-naris to internarial width 1·29.

HABITAT: This species and its various geographical races appear to be restricted

to rocky outcrops and ranges in the interior. All the monitors from Mt Doreen district were found under slabs of loose rock, and the specimen from Labbi Labbi was found basking on a rock ledge. The species is not as agile as most of the other Australian monitors, and little difficulty was experienced in securing the specimens.

DISTRIBUTION: Throughout the N. parts of Australia, except the NW. where the type form is found, and in N. Q'ld where a distinct race, *V. acanthurus primordius* has been described. The population on Groote Eylandt is regarded by Mertens (1958) as racially distinct on the basis of colour pattern, and has been named *V. acanthurus insulanicus*. *V. acanthurus brachyurus* is readily distinguished by the serrated nature of the scales at the base of the tail.

Family SCINCIDAE

Genus **Tiliqua**

Tiliqua occipitalis multifasciata Sternfeld 1919

(Pl. XLIV, fig. 2)

Mitt. Senckenb. Naturf. Gesell 1: 79 (type locality Hermannsburg, N.T.).

Two specimens of this subspecies were taken at Labbi Labbi, W.A., by Bindibu natives, but they were eaten by the aborigines and no specimen was collected.

DESCRIPTION: This race is distinguished from the typical form by the more numerous bands across the body, numbering from 12 to 15, and from 10 to 12 on the tail.

DISTRIBUTION: Loveridge (1934) records examples from Broome, W.A., Birchip Downs, Mt Peake, Anningie, Teatree Well, and Hermannsburg, N.T.

Genus **Egernia**

Egernia inornata Rosen 1905

Ann. & Mag. Nat. Hist. (7) xvi: 139 (type locality W.A.).

MATERIAL EXAMINED: Waimbirr'ngi, N.T., 1, DFT No. 1264.

DESCRIPTION: This specimen has 38 rows of scales around the centre of the body; prefrontals in contact medially; 5 auricular lobules; 7 supralabials, the fifth and sixth below the eye. There are 23 lamellae beneath the fourth toe. Length 211 mm, tail length 106 mm, ratio tail to total length 0·50, ratio eye-naris to internarial width 1·27.

HABITAT: This skink was dug from a deep burrow under a clump of spinifex.

DISTRIBUTION: Mitchell (1950, p. 284) records examples from the S. part of N.T., the N. part of S.A. and the Frazer Ra. district of W.A.

Egernia kintorei Stirling & Zietz 1893

(Pl. XLIV, fig. 1)

Trans. Roy. Soc. Sth Australia xvi: 171 (type locality Northern Victoria Desert, W.A. 'lectotype').

MATERIAL EXAMINED: Labbi Labbi, W.A., 1, DFT No. 1265; Kimai, N.T., 1, DFT No. 1266; Waimbirr'ngi, N.T., 2, DFT No. 1267 and 1268.

DESCRIPTION: This species has recently been described from a lectotype in the South Australian Museum by Mitchell (1950, p. 284). The present series possess 47 to 49 rows of scales around the centre of the body. There are 8 supralabials, the

sixth and seventh below the eye, but separated from the orbital periphery by a complete series of infraoculars. Lamellae beneath the fourth toe vary from 19 to 21. The largest specimen, a male (DFT No. 1265)—total length 379 mm, tail length 189 mm, ratio tail to total length 0·50.

HABITAT: These skinks were found in burrows under clumps of spinifex, and have the same habitat as the closely related *E. inornata* Rosen. *E. kintorei* is a larger species and differs also in having a yellow ventral surface, which is white in *E. inornata*.

DISTRIBUTION: Recorded from C. and NW. Australia, probably also occurring in W. N.S.W. and Q'ld.

Genus **Sphenomorphus**

Sphenomorphus australis (Gray)

Tiliqua australis Gray 1839 *Ann. Nat. Hist.* 2: 291 (type locality Australia).

MATERIAL EXAMINED: Labbi Labbi, W.A., 5, DFT No. 1294-1298.

DESCRIPTION: One specimen (DFT No. 1294) has 30, the remaining 4 each have 28 rows of scales around the centre of the body, prefrontals in medial contact, nasals in contact in 3 specimens (DFT No. 1296-1298) and separated in two. Ear opening vertical with 3 anterior lobules. One specimen (DFT No. 1296) has 2 pairs of nuchals, the remaining 4 each have 3 pairs. There are 8 supralabials, the sixth below the eye. The lamellae beneath the fourth toe vary from 21 to 24. The largest specimen, a female (DFT No. 1295)—length 249 mm, tail length 170 mm, ratio tail to total length 0·68. After preservation the colouration was variable, ranging from a uniform brown to a striped or variegated pattern.

HABITAT: These lizards were collected in open sandy areas among clumps of spinifex close to rocky outcrops. In the hot conditions of the desert they moved with great rapidity.

DISTRIBUTION: From NW. W.A. through N.T. to Q'ld and S. to N.S.W.

Sphenomorphus ocellatus (Boulenger)

Lygosma ocellatum Boulenger 1896 *Ann. Mag. Nat. Hist.* (6) 18: 233 (type locality Roebuck Bay, Broome, W.A.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 2, DFT No. 1286 and 1287.

DESCRIPTION: DFT No. 1286 is an adult with 36 rows of scales around the centre of the body, these scales decreasing in size on the lateral line and towards the ventral surface. Prefrontals are in broad contact and equal in size to the frontonasal. There are 5 supralabials anterior to the subocular, 4 anterior ear lobules. There are 26 keeled lamellae beneath the fourth toe. Tail incomplete, length snout to vent 84·0 mm, tibial length 11·2 mm, ratio tibial length to snout-vent length 0·13, ratio eye-naris to internarial distance 1·80. Colour after preservation brown above with white spots arranged longitudinally, edged above and below with black; sixth and seventh supralabials white anteriorly, black posteriorly. DFT No. 1287 is a juvenile and differs from the adult in the following respect: scale rows around midbody 34; lamellae beneath fourth toe 23, ratio eye-naris to internarial distance 2·10, tibial length to snout-vent length 0·12; tail complete; total length 115·0 mm, ratio tail length to total length 0·62. Chin shields are edged with black and 3 dark longitudinal lines appear on belly from throat to vent.

HABITAT: Captured in open sandy desert among spinifex.

DISTRIBUTION: The species has been taken in W.A. from the Canning Stock Route, the NW. and as far S. as Quairading and Beverley.

Genus **Ablepharus**

Ablepharus greyi (Gray)

Menetia greyii Gray 1844 *Zool. Erebus & Terror Rept.* Pl. v, fig. 4 (type locality W.A.).

MATERIAL EXAMINED: Mt Doreen Station, N.T., 1, DFT No. 1281.

DESCRIPTION: This skink differs from Boulenger's description (1887, p. 349) in having 20 instead of 22 rows of scales around the centre of the body, and the frontal shield separated from the frontonasal by a broad contact of the prefrontals, instead of in contact with the frontonasal. Total length 66 mm, tail length 39 mm, ratio tail to total length 0·59, eye-naris to internarial distance 1·27. Dorsal colour after preservation, light brown with white stripe extending from the fourth supralabial, through the small ear opening, above the insertion of the forelimb to the groin, this white stripe being edged with a broad dark brown stripe above and a narrow dark brown stripe and 2 indistinct stripes below. Ventral surfaces are white.

HABITAT: This specimen was found under a small rock at the base of a rocky hill.

DISTRIBUTION: The species seems to be restricted to the dry regions of W.A., N.T., N.S.W. and Q'ld.

Genus **Cryptoblepharus**

Cryptoblepharus taeniopleurus (Peters)

Ablepharus (Morethia) taeniopleurus Peters 1874 *Monatsb. Akad. Wiss. Berlin* 375 (type locality Bowen, Q'ld).

MATERIAL EXAMINED: Labbi Labbi, W.A., 3, DFT No. 1283-1285.

DESCRIPTION: The name *Cryptoblepharus* of Wiegmann (1834) is used instead of *Ablepharus* Fitzinger (1823) on the authority of Mittleman (1953). The specimens under examination agree with the description of the type specimen. The largest of the specimens (DFT No. 1299)—length 68 mm, length of tail 33 mm, ratio tail to total length 0·49, eye-naris to internarial distance 1·50. In life, tails were red and in colouration agreed with the lizard described by Lucas & Frost (1896) as *Ablepharus lineoocellatus* var. *ruficaudus* (Pl. X, fig. 3). This lizard is considered as synonymous with *A. taeniopleurus* by Loveridge (1934, p. 378).

HABITAT: All 3 specimens were found in rocky terrain under small slabs of rock.

DISTRIBUTION: W.A., N.T., Q'ld and S.A.

Genus **Rhodona**

Rhodona bipes Fischer 1882

Arch. fur Naturg. 48: 292, Pl. xvi, fig. 10-15 (type locality Nickol Bay, W.A.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 1, DFT No. 1278.

DESCRIPTION: The single specimen collected agrees with the type description; there are no forelimbs but hind limbs are present, each with 2 digits. Limb length amounts to 9·4 mm, the outer digit measures 3·1 mm, the inner 1·2 mm. Ratio eye-naris to internarial width 1·4, length snout to vent 51 mm. The tail in this

specimen is regenerated. Colour after preservation pale yellowish-brown with two series of dark brown spots down the mid dorsal line of body and tail, and a brown lateral stripe commencing at the nostril, continuing through the eye and temporal region, broadening and extending along body and tail.

HABITAT: This specimen was found under a rock at the base of a tree.

DISTRIBUTION: The species has been reported from W.A., central area of N.T., and S.A.

OPHIDIA

Family TYPHLOPIDAE

Genus **Typhlops**

Typhlops diversus Waite 1894

Proc. Linn. Soc. N.S.W. (2) 9: 10 (type locality Australia).

MATERIAL EXAMINED: Labbi Labbi, W.A., 2, DFT No. 1305 and 1306.

DESCRIPTION: These 2 blind snakes fit Waite's (1894) description exactly. There are 20 rows of scales around the centre of the body, the nasal cleft contacts the preocular; diameter of body is included 64-66 times in total length. Total length—larger specimen (DFT No. 1305) 364 mm, smaller specimen 192 mm.

HABITAT: These blind snakes were secured in loose sand when the surface was disturbed soon after rain.

DISTRIBUTION: This species inhabits the arid regions of C. Australia, including parts of W.A. and S.A.

Family BOIDAE

Genus **Aspidites**

Aspidites ramsayi (Macleay)

(Pl. XLIV, fig. 3)

Aspidiotes ramsayi Macleay 1882 *Proc. Linn. Soc. N.S.W.* 6; 813 (type locality Bourke, N.S.W.).

MATERIAL EXAMINED: Kimai, N.T., 1, DFT No. 1269.

DESCRIPTION: This specimen is a female having 52 rows of scales around the centre of the body; 285 ventral scales and 52 subcaudals; the anal scale is entire. There are 11 or 12 supralabials, the sixth entering the orbital periphery. There are 2 prcoculars on the left side and 3 on the right, with 3 postoculars on the left side and 4 on the right; there are 2 loreals. Total length 1562 mm, tail length 120 mm, ratio tail to total length 0·076.

HABITAT: This python ranges throughout the sandy regions of C. Australia where it lives in burrows. An excellent account of this snake is given by Waite (1929, p. 203). The Bindibu who brought in this specimen called it 'kuka', i.e. the generic name for all game or animal food.

DISTRIBUTION: This species occurs throughout the dry interior and extends into all States except Victoria. Its range extends northward as far as a line from lower Kimberley in W.A. through Newcastle Waters in the N.T. to the Dawson Valley in Q'ld.

Family ELAPIDAE

Genus **Acanthophis**

Acanthophis pyrrhus Boulenger 1898

Ann. Mag. Nat. Hist. (7) 2: 75 (type locality Station Point, N.T.).

MATERIAL EXAMINED: Mt Dorcen Station, N.T., 1, DFT No. 1245.

DESCRIPTION: This specimen, a male, possesses 21 scale rows around centre of body, 145 ventrals, a single anal scale and 40 entire caudals. The characteristic compressed and strongly imbricate terminal caudal appendage is missing. On the head are 4 prefrontal shields (the median pair considerably larger than the outer); nasal scale entire and in contact with the single preocular; 2 postoculars and 2 suboculars; 6 supralabials, the third and fourth touching the orbital region. The temporal formula is 1 + 3, and the lower posterior temporal is deeply wedged between the fifth and sixth supralabials. Measurements—body length 367 mm, tail (incomplete) 65 mm, head width 14·1 mm, head length 22·7 mm, ratio head width to head length 0·62; eye to naris 3·3 mm, internarial distance 5·1 mm, ratio eye-naris to internarial distance 0·65; horizontal diameter of eye 2·8 mm.

The hemipenis has been examined (*in situ*) and found to extend to the fourteenth pair of caudals, the sulcus spermaticus bifurcated at the tenth pair of caudals. Base of the organ is smooth, becoming spiney at about the middle and continuing to the tip, the spines being arranged in 14 diagonal rows. The maxilla carries paired fangs, followed after a long diastema by 2 small teeth.

HABITAT: This snake was found under a stone at the base of a rocky hill. The region is dry, semi-desert country supporting only sparse vegetation.

DISTRIBUTION: This desert form of the Death Adder ranges over a wide area of C. Australia. It has been collected in W.A., S.A., N.T., and in far W. Q'ld. This specimen was a typical desert form, highly coloured in contrast with the sombre colour, predominantly grey, of the typical species, *A. antarcticus*, of the higher rainfall areas.

AMPHIBIA

Family LEPTODACTYLIDAE

Genus **Notaden**

Notaden nichollsi Parker 1940

Novit. Zool. 42 (1): 63 (type locality Roebuck Bay, Broome, W.A.).

MATERIAL EXAMINED: Labbi Labbi, W.A., 6, DFT No. 1311-1316.

DESCRIPTION: These specimens agree well with the type description, except that one of our specimens has the naris slightly closer to the eye than to tip of the snout. Ratio eye-naris to internarial distance averages 0·97, range for the 6 specimens being 0·94 to 0·99. The largest specimen, a female (DFT No. 1316) measures from snout to vent 61·0 mm, and the 4 males range from 52·0 mm to 60·0 mm. Colour after preservation is greyish-brown, with a few scattered black spots on the dorsal area; flanks are peppered with small white spots, as are the upper surfaces of the limbs and the cloacal region. The throat in the male specimens is dark brown.

HABITAT: Following a deluge of rain, traces of a white mucilaginous secretion were noted on the crest of a dune and the surface was disturbed around raised

mounds marking points of entry into the sand. On digging to a depth of about 4 ft, at which depth the sand was moist and cool, these frogs were found. The name applied to this frog by the Bindibu is 'dirri'.

DISTRIBUTION: This species ranges from N. W.A. to the C. region of N.T.

Notes

Gekkonidae were not only restricted in the number of species collected, despite special attention to this group, but also in the actual numbers that were secured. The distribution of lizards of this family was influenced to a greater extent by the heat and the arid conditions, and more obviously, than that of any other group.

Except in the case of *Nephrurus wheeleri*, of which a single specimen was collected at Labbi Labbi under a dense clump of spinifex, the geckos taken at Mt Doreen and at Labbi Labbi were found only under large rocks, or on rocky outcrops where they were well protected from excessive dehydration by the sun, and where they could forage at night, since all these species are nocturnal in habit. None was discovered under bark, a habitat normally favoured by these lizards, since bark or wood exposed to the sun must inevitably become excessively hot in this arid terrain, where trees are small and often widely dispersed, resulting in maximum exposure.

The known distribution of *N. wheeleri* indicates that this species is largely desert-dwelling, or belongs at least to an arid habitat. As has been indicated, the specimen collected was found under heavy spinifex, which would protect it from exposure to sun heat or the dehydrating effect of hot air, and humidity would be maintained by evaporation from the ground and by transpiration. Arthur Loveridge of the Museum of Comparative Zoology, Harvard, Cambridge, Massachusetts (1934), recorded having collected 5 specimens of this lizard at Yandil, near Wiluna in C. Western Australia. Specimens attributed to this species were collected by the Horn Expedition and were determined by Lucas & Frost (1896) as *N. laevis*, which was considered synonymous with *N. platyurus*. Subsequently, however, these specimens were referred by Loveridge to *N. wheeleri*.

As has been pointed out, climatic conditions are much less severe in the vicinity of Mt Doreen, and there is a seasonal growth cycle which is predictable and is reflected in the fauna. In the rocky outcrops of this area, generally under stones, a number of geckos were collected, referable to two species of separate genera—*Heteronota binoei*, of which 19 specimens were obtained, and *Peropus variegatus*, 18 of which were secured near Mt Doreen. A further 14 specimens of *P. variegatus* were collected in rocky outcrops at Labbi Labbi, in desert terrain.

In the dragons, 7 genera occurred in the actual desert, each represented by a single species, and most of these were sufficiently numerous to provide a major reserve of food for the nomadic desert people. It is of interest to record the fact that the Bindibu are the only people known to one of the authors (D. F. Thomson) in many years of experience among tribal aborigines, who regularly exploited the agamids, with the exception of *Chlamydosaurus kingii* and *Amphibolurus barbatus*—as food. Among the Bindibu, the only lizard of the agamid group that enjoyed immunity was *Moloch horridus*, popularly, though anomalously, known as the 'Mountain Devil'.

The foregoing preliminary notes on the Agamidae collected on this expedition show that two of these lizards, members of different genera, *Amphibolurus barbatus minor* and *Physignathus longirostris*, contrived to maintain the arboreal habit

characteristic of many of the dragon lizards, and unlike the species which occurred in the open sands, they had not adopted a burrowing habit.

Physignathus longirostris, an arboreal lizard with an extremely long tail, is remarkable for the extraordinary rapidity of its movements. A number of specimens were seen and two collected. These lizards were found in dead hollow limbs of dwarf Mallee Eucalypt trees where they were protected from the direct heat of the sun. These hollow spouts were often cracked and fissured and so were well aerated, enabling the lizards to survive as they could not have done on the surface of the sand. The retention of this and certain allied species in the genus *Physignathus*, members of which are typically aquatic in habit, is open to question, and will be re-assessed by the authors at a later date.

The second of the desert agamids to retain the arboreal habit characteristic of the genus was *A. barbatus minor*, of which a number were taken by the Bindibu and two (No. DFT 1270 and 1271) were collected. These lizards occurred generally in the low-lying area below the cliffs that border Red Cliff Pound, near Labbi Labbi rockhole. They occurred also in clumps of fairly dense mulga that grew in a silt deposit left by drainage waters in a basin to the E. of Labbi Labbi. It was noted that all specimens examined showed consistently the small size and the characteristics that appear to justify the term 'minor' for this rather distinctive geographical race, which may lead to its separation as a distinct species.

Moloch horridus occurred among spinifex, under which it sheltered, but in spite of its apparently heavy protective armour, it was never seen on the exposed sand of the open desert.

Two species of the agamid lizards, *A. caudicinctus* and *Tympanocryptis cephalus*, were rock-haunting forms, living close to the boulder zone of rocky hills and escarpments and sheltering under stones. Neither species had adopted a colonial habit.

The two remaining agamids, the desert form of *Amphibolurus maculatus gularis*, which is regarded as a distinct race by Sternfeld on specimens collected at Hermannsburg in the MacDonnell Ra., and *Amphibolurus reticulatus inermis*, have both adopted a sand burrowing habit upon which their survival in the desert depends. While the spinifex cover remained, these burrows were relatively shallow, but after the spinifex had dried out and been swept by fire, laying bare the sand, these tunnels were often very deep. Both species are strongly colonial.

After a long drought, lizards of these two species were collected in very large numbers by the Bindibu outside Labbi Labbi from 'reservoirs' deep in the sand. An aborigine was seen to halt suddenly on an expanse of bare sand, cast around for a few seconds, and having detected signs which he knew from long experience to be significant, dig straight down with his hands, at the same time using his wide concave spear-thrower as a scoop. In this way he uncovered a colony of 12-15 of these *A. reticulatus inermis*, tapped their heads on his spear-thrower as he extracted them, and gathered them into a bunch by gripping them around the necks. They were carried back to camp and cooked lightly in the embers of a fire, each lizard being picked up half-cooked, the abdominal cavity torn open, and the mesenteric fat, the liver and heart picked out and eaten. Each lizard in turn was treated in this way and then replaced in the embers, when the ashes were raked over and they were cooked again for a few minutes. The rough file-like skin was thus removed, and practically the whole of the little reptile, including most of the bones, was eaten.

There is no doubt that the sand burrowing and the gregarious habit have enabled

these lizards to withstand the intense heat and arid conditions in the sandy desert, and that the ability of the aborigines to find these colonies and to utilize every part of these apparently insignificant lizards has been a factor in the survival of the Bindibu in parts of the desert where the white man, strange to this environment, sees no game and can find nothing that appears to be edible.

The agamid lizards that have been discussed are not the only animal food, but they are a safe reserve in times of real adversity. These reptiles appear to feed at night or early in the morning, so that the hunter must find the tell-tale tracks on the sand before the dew dries away in the sun, and the wind obscures them.

As the above list shows, 4 species of *Varanus* were collected, all of which were keenly relished by the Bindibu. The habit of *V. gilleni* of seeking shelter under the thick bark of the desert oak (Pl. XLII, fig. 1) has been described. *Varanus acanthurus brachyurus* is a rock-haunting species that occurred at Red Cliff Pound and in the rocky outcrop at Waimbirr'ngi. *V. eremius* and *V. gouldi flavirufus* were found in the spinifex that fringed the dunes and these reptiles sought refuge underground in burrows in the sand. In an environment as harsh as the Great Sandy Desert, where the tracks of even small reptiles can be picked up unerringly by the aborigines when the spinifex covering has been denuded, lizards, especially large forms like *Varanus* are nowhere numerous, except where a heavy spinifex cover has remained long unburned, giving them sanctuary to breed.

Of the skink lizards obtained on this expedition, all but one species were collected between Kimai and Labbi Labbi. The exception was a single specimen of *Ablepharus greyi*, a small active lizard which was found under a slab of stone at Mt Doreen.

Of the larger species, which play an important part in Bindibu economy, *Tiliqua occipitalis multifasciata*, the western or desert form of the familiar Blue-tongued Lizard of coastal Australia, was seen at Labbi Labbi and at Kimai, where a number of specimens were secured by the Bindibu nomads when we first met them in camp near the well. These lizards, with their fleshy bodies and thick tails, were savoured by the Bindibu, whose food gathering routine we could not risk upsetting on our first contact. These people had camped near the well for some days during which we were on a reconnaissance over the Western Australian border, and when we returned to Kimai the game, including larger edible lizards, had been depleted so that the area was no longer a promising collecting ground.

On the first reconnaissance, William Hosmer remained at Waimbirr'ngi with a young Bindibu man. In the sandy terrain close to the bluff he secured specimens of 2 fine *Egernia* which the native dug from burrows 3′ 6″ to 4′ deep in the sand. Both lizards are a fresh salmon pink on the dorsal surface, sometimes with a coppery tinge, body scales on each smooth and with a metallic sheen. Subsequently these lizards were identified as distinct species, *E. kintorei*, of which 3 specimens were collected, and a single specimen of *E. inornata*. The former species is larger and has a pale yellow ventral surface in contrast with the white undersurface of *E. inornata*. Other distinctive characters are apparent in the description.

We soon learned that both these lizards were valued highly by the Bindibu as 'kuka', the generic term applied to all game and to all animal food, and that both were known to the people by the name 'war'na'. In the months that we spent with the Bindibu we came to understand the importance of these skink lizards which, with certain agamids, had adopted a sand-burrowing habit for survival, and provide a reserve of animal food that, in a less harsh and arid environment, would not be available in such concentration, or so readily accessible.

Of the 5 snakes collected on this expedition, 2 were of the family *Typhlopidae*, the status of which await final determination.

The single specimen of *Acanthophis pyrrhus* collected was found under a rock at the base of a hill in semi-desert terrain near Mt Doreen. This Death Adder had scales of a bright coppery-red colour, and bore serrations in ridges like a file.

Two specimens of one of the python group, *Aspidites ramsayi*, were obtained, one at Kimai well, the other, a smaller specimen, conspicuously marked on the dorsal surface by the transverse brownish bands characteristic of this snake, was dug out of a hole in a sand dune near Wirrarigulong.

The genus *Liasis* was represented by a single specimen, *Liasis childreni*, of which a skull only was found among the boulders of Waimbirr'ngi Bluff.

As might be expected under desert conditions and at the end of a long drought, amphibians were conspicuous by their absence in most parts of the Great Sandy Desert. Frogs were never seen in any of the wells or rockholes and no frog spawn was noted, even following the torrential rains that fell in June 1957, nor were any frogs seen in the open, as often occurs in other arid areas after very heavy rain, in spite of the fact that some hundreds of miles of desert were traversed. The fact that many of the permanent waters or morasses, such as L. Mackay and L. Hazlett, Wills and White, have a heavy concentration of salt may contribute to the almost complete absence of frogs in this desert. Frogs are extremely intolerant to brackish water, particularly on account of the respiratory function of the epidermis. The only drinking water of the desert Bindibu occurred in wells, rockholes, and claypans, none of which would provide sufficient pure, i.e. mineral free, permanent water, nor a sufficiently low temperature, with the probable exception of Labbi Labbi.

The deluge of rain, amounting to several inches, in June 1957, fell suddenly while we were in Red Cliff Pound. For the first and only time when we were in the desert, Labbi Labbi overflowed and poured like a waterfall into Red Cliff Pound. The creek beds in Hidden Valley, emptying into L. Hazlett, became raging torrents, and the country was impassable for several days. When we could get our vehicles out, we camped under a sand dune about 3 miles E. of Labbi Labbi. The night was clear and cold, with the heaviest dew we had ever experienced. Early the following morning we found that the sand on the crest of the dune had been disturbed and showed tracks that were new to us. There were traces of a milky mucilaginous secretion, and slightly raised ridges at the point where the tracks stopped. The Bindibu guide to whom we showed the tracks evidently recognized them and began to dig into the sand to a depth of about 4 ft, where we found 6 adult specimens of *Notaden nichollsi*, to which the Bindibu gave the name 'dirri'. No trace of a burrow was seen, so that in digging into the sand, the frogs had closed the tunnel behind them, thus reducing circulation of air and doubtless also the loss of water by evaporation, by the amphibians deep in the moist sand. The frogs appeared to be in good condition and showed no sign of dehydration. It seemed reasonable to assume that they had emerged from their deep burrow during the previous night after heavy rain had fallen, and that they were fully hydrated and capable of enduring a further long term in the arid conditions.

The fact that no less than 6 adult specimens were discovered on this occasion in one place suggests that this frog is not uncommon, which is also supported by the fact that it was obviously well known to the Bindibu natives, but it has adopted a specialized habitat and habits to survive. A review of known facts on water metabolism of vertebrate animals in desert conditions, including reptiles and amphibians, has been presented by Robert Chew (1961).

In view of the apparently sporadic and unpredictable nature of the rainfall in this area, and the absence of any water storage on the surface sand, the breeding habits of this frog may be worth study.

Again, it was noted that the sand on the crest of these dunes was looser and coarser in texture than on the sides of the sandhills, and although it was more exposed to the heat of the sun and to the bitter winds that often blow, we confirmed an early observation that the flora on the crests was often less stunted and less strongly xerophilous than of the sides. At a depth of 4 ft, we found the sand was moist and cool.

During the entire period of more than 5 months in the desert, the 6 specimens of *N. nichollsi* referred to above were the only frogs seen and collected. However, a thin, high-pitched, rather musical call which was unmistakably that of a small frog, was often heard after nightfall, particularly after the rain, in the low-lying country away from salt marshes or other areas where the sand might be impregnated with salt, calcium salts, lime or other chemicals. Repeated attempts to secure specimens of this presumed frog that was heard, the call of which was reproduced on tapes, proved fruitless.

There is no doubt that the feral cat which, with the European fox, has penetrated to the remotest part of the desert, has taken a heavy toll of the desert fauna, including those of the rocky outcrops and boulder zones. Because the feral cat is relished by the Bindibu and hunted by these people in the open, where it is an easy prey, its only refuge is among big outcrops of rocks where it can breed. But it must inevitably have depleted the small game of these boulder zones, as well as of the terrain in the immediate vicinity. Doubtless, in this way the cat has had a disturbing and disruptive influence on the distribution of reptiles and mammals, especially in the Great Sandy Desert, and to a slightly lesser extent, of birds, that is difficult to assess today.

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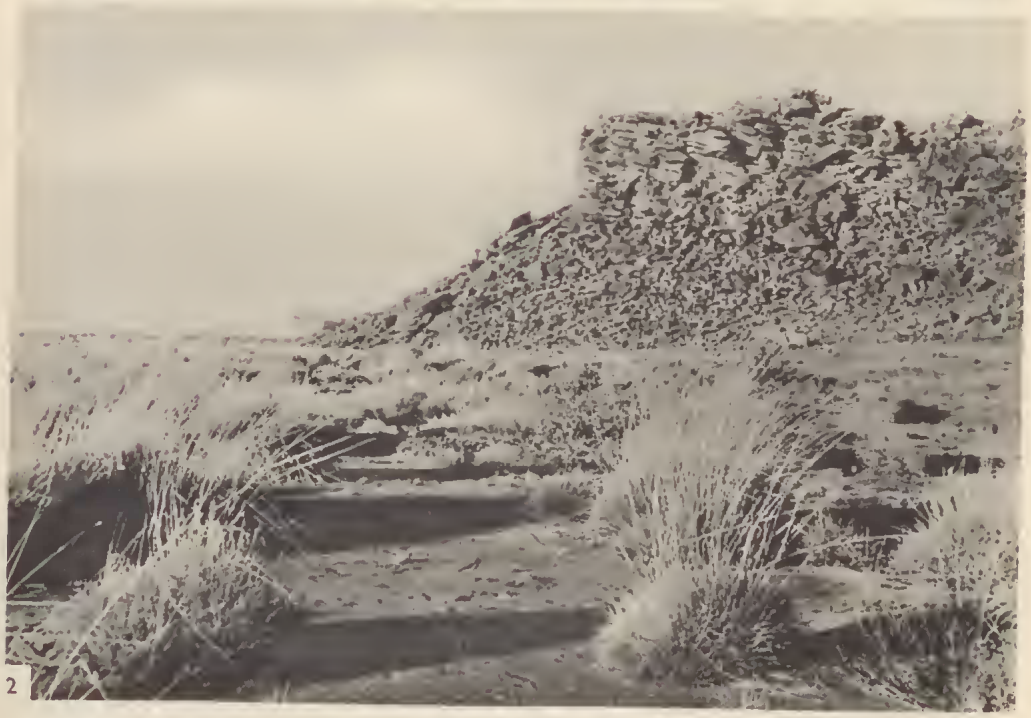

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